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A PRACTICAL SERVICE AND IDEAS PUBLICATION FOR TEACHING AND RESEARCH IN THE LIFE SCIENCES FROM THE ELEMENTARY GRADES THROUGH COLLEGE

Official journal of

The National Association of Biology Teachers

JANUARY, 1954 VOL. 16, NO. 1

TABLE OF CONTENTS

Unit on Marine Biology
Irene Hollenbeck 5

logy for the General Pupil
Charles Tanzer
Louis Eisman 9

king a "Diameter Tape" . . Hal Arntzen 12

Biology Teachers Use Live Materials
Cyril E. Abbott 15

bryological Studies for the High School
Biologist . . . . . Mark L. Menzel 16

logy Class Prepares Red Cross Exhibit
Marcellus C. Miller 17

logy in New England State Teacher
Training Institutions . . Frank J. Hilferty 18

ross The Editor's Desk 20

ers 22

ex for Volume 15 22

Changeable Electric Bulletin Board
Paul V. Webster 24

Biologist's Life in West Germany
M. C. Lichtenwalter 25

ks for Busy Biologists 26

logy in the News 27

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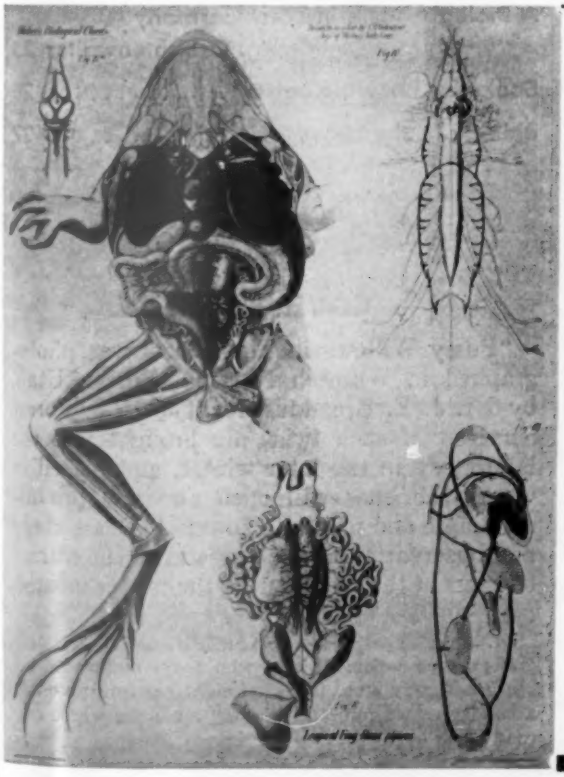

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Vol. 16 JANUARY, 1954 No. 1

TABLE OF CONTENTS

A Unit on Marine Biology — Irene Hollenbeck 5

Biology for the General Pupil — Charles Tanzer, Louis Eisman 9

Making a "Diameter Tape" . . Hal Arntzen 12

Do Biology Teachers Use Live Materials — Cyril E. Abbott 15

Embryological Studies for the High School Biologist . . . . . Mark L. Menzel 16

Biology Class Prepares Red Cross Exhibit — Marcellus C. Miller 17

Biology in New England State Teacher Training Institutions . . Frank J. Hilferty 18

Across The Editor's Desk 20

Letters 22

Index for Volume 15 22

A Changeable Electric Bulletin Board — Paul V. Webster 24

A Biologist's Life in West Germany — M. C. Lichtenwalter 25

Books for Busy Biologists 26

Biology in the News 27

COVER PHOTO

"Pussy Willows in The Snow" was photographed in Wasatch National Forest, Utah, by Dr. J. E. Broaddus, for The U. S. Forest Service. If such twigs are brought into the laboratory in the later winter, and placed in water, the buds will open and will provide staminate and pistillate flowers for class study and observation, as well as add to the attractiveness of the room during the winter months.

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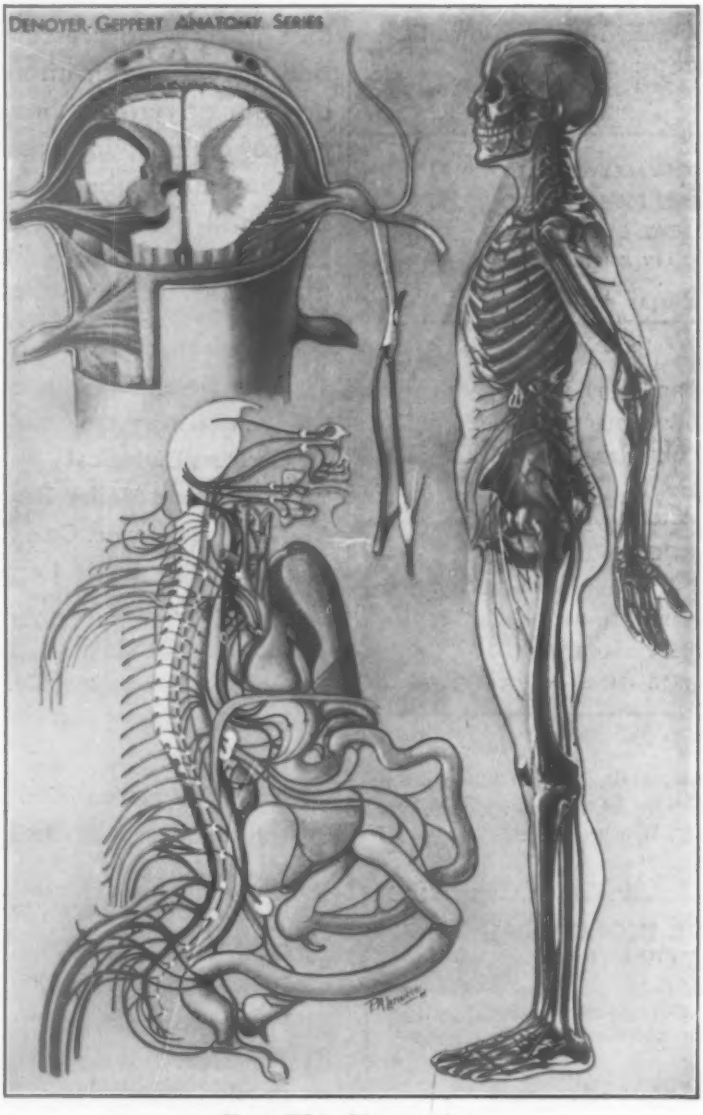

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A UNIT ON MARINE BIOLOGY

IRENE HOLLENBECK, Salem Senior High School, Salem, Oregon

A day at the beach, to the clam-digger, usually means labor with a long clam shovel; to the sports fisherman it may mean four hours of pitching and rolling on a tiny deep sea troller; but to the members of the writer's biology classes it becomes a day of discovery, a day when familiar headlands and sandy beaches are explored as the homes of the most fascinating creatures they have ever seen.

The author of this very interesting and practical article on Marine Biology is on leave this academic year for travel and study under a Fellowship from The Fund for the Advancement of Education. Her present address is: International House, 500 Riverside Dr., New York 27, N. Y.

Your Editor would welcome other articles on Seashore Projects and activities for our many members who make use of the ocean and its materials in their teaching, laboratory, or research work.

This day at the shore is the climax of a unit on Marine Biology. The unit is planned to help students attain the knowledge and understanding of seashore life that will enable them to get the most out of all their trips to the beach. At the same time, while interest is running high with the prospect of a trip to the coast, it serves as a natural and easy way to develop an understanding of the classification of animals and provides a real and immediate need for learning something of the characteristics of each group. Stories that former students tell of exciting adventures of past years and the anticipation of a field trip to the shore serve to make this the most-looked-forward-to unit of the year.

Our shore trips are scheduled for school days in late spring when we may take advantage of extreme low tides and possible good weather. Each class of 30 is allowed a separate day for the trip. Like all other units of our biology course it is planned by a committee of students working with the teacher. Long before time to take up the study of marine life the members of the Marine Biology committee have checked the card catalog and *Readers Guide* for interesting books and current magazine articles on the subject, and have perused our sets of supplementary texts to find those which give the topic the best treatment. They have selected interesting movies and film strips on seashore life; they have worked out ideas for laboratory studies and have made a list of oral reports, special credit projects and other classroom activities that will help all the pupils prepare for their trip to the coast. By the time the class is ready to start the unit, the committee has selected the most interesting of these activities to have mimeographed and presented to the class. Not all of the activities on the list are completed by each student, for each has the privilege of selecting for study those which fall within his interest and ability range.

The manner in which the unit develops depends, of course, upon the needs and desires of the students in the classes and consequently varies from year to year. This year the first few days of work on the unit were spent viewing 35 mm. color slides and a movie in color of last year's classes at work exploring tide pools and mussel-covered reefs. This gave the

At extreme low tide, pupils explore the quiet tide pools of a mussel-covered reef.

class a splendid opportunity to observe and discuss the environmental factors which influence life in the narrow intertidal area they were to explore later. The tremendous power of the waves, the danger of offshore currents, and the rise of the tide were also discussed from the standpoint of student safety. Ignorance of these factors could be disastrous. The pictures, too, gave us an opportunity to note the tidal horizons, the various substrata of rock, sand, and mud, and to discuss the special plant and animal communities to be found in such habitats as exposed rocks, under rocks, in the substratum, and in the quiet tide pools.

Following this introduction, each student selected an animal or group of animals of particular interest to him and became a "specialist" in his field. Although oral reports are never required assignments, in this case every student planned to make one. After a few days of library research and an examination of classroom specimens, the student was able to tell the class where to look for the animal, what it ate, how it met the special problems of the shore (especially wave-shock and the alternate periods of water), and some of its interesting or unusual habits or adaptations. In presenting the material to the class some "specialists" made drawings (even cartoons) on the blackboard to illustrate a point, others brought colored posters made at home, some showed pictures from magazines such as *Life*, *Nature*, and *National Geographic* by using the opaque projector; a few used filmstrips from our film library. All, of course, had animals preserved by former classes to pass around. Plants to be found at the shore were studied from filmstrips and mounted specimens. This phase of the work was enlivened by student exhibits of common substances which contained derivatives of seaweeds and included agar agar, ice cream, chocolate milk, iodized salt, iodine, some kinds of candies, and certain scouring powders.

In the meantime the committee had chartered busses for the field trips and determined the amount of bus fare to be collected from each student. This was collected and receipted for in advance of the trip, but only after each student had filed a note from his parents giving him permission to go to the coast with the class. This note was a part of a mimeographed form concerning the field trip which each student took home to his parents.

Because the classes always assist in planning field trips, no two are ever alike. This year my students asked to have mimeographed instructions to take along—something that would help direct their activities, yet leave them free to pursue their respective interests. These directions (see later) were duplicated on oak tag paper heavy enough to withstand damage from wind, rain, or a possible dunking in a tide pool, and of a size that would fit into pockets of jackets or jeans. One year we used a check list; another year we collected in groups and displayed our catches before returning the animals to the ocean.

Collecting equipment was simple. Students were advised to wear old clothes, and rubber boots if they had them. Wool socks and old shoes also made suitable footwear. A heavy case knife for removing mollusks from the rocks, a small glass jar for carrying very soft animals such as worms and brittle stars, and a small pail, completed the equipment. The jar and pail were merely for the convenience of carrying the animals around for all to see before returning them to the water. Our conservation-conscious students were quite indignant when they saw the other visitors to the area carrying out buckets of starfish and sea urchins which would eventually decompose and add to the discomfort of the collectors.

We try to arrive at the beach at least a half hour before low tide in order to insure an unhurried study of the tide pools at the extreme low tide horizon. As a safety measure we use the buddy system so common at summer camps; each student chooses his own partner and stays with him the entire day.

After the tide comes in and most of the animals are once more submerged, the young people are free to enjoy other activities at the beach. Some study living animals more carefully in our observation pans, watching the production of the byssus by a mussel or the spawning of sea urchins; a few like to dissect a starfish, clam, or sea urchin; photography, collecting, and sketching occupy the time of others. Those who are interested in preserving animals begin their work at the beach.

By preparing a few mounted specimens each year our classroom exhibits of marine life are renewed or augmented. To keep our collection as uniform as possible we try to find specimens that will fit into 8 oz. jars with screw lids. The animal is tied to a glass slide that will fit into the jar on a slant so that all parts will be visible and a solution of 4% formalin is added. The addition of small amounts of glycerin to jars containing crabs, shrimp, and isopods will keep them from becoming brittle. If the preservative becomes discolored, it is poured off and new added. We have found that animals preserved in sea water to which formalin has been added have less tendency to lose their color than those in solutions of formalin and fresh water. It is difficult to preserve sea anemones, nudibranchs, worms, and sea cucumbers with tentacles or respiratory organs protruding. We can sometimes succeed in doing this by leaving the animal in sea water until the oxygen supply is low and then gradually adding small amounts of the preservative.

Echinoderms are placed in a shallow pan and covered with sea water. We allow the starfish to move about until they have assumed the shape in which we want to preserve them. This may take an hour or more. We then kill them by gradually adding small amounts of formalin. After leaving them in this solution for several hours or several days (depending upon the size of the animal), they are removed, placed on newspapers, and allowed to dry slowly.

Chitons will curl up when removed from the water, so it is necessary to devise some scheme whereby they may be preserved in an extended position. We place glass slides in the bottom of a shallow pan, allow the chitons to become attached to the slides, tie them securely, and then immerse them in a 4% solution of formalin. Some collectors prefer to place the chitons in a glass jar of sea water until the animal clings to the sides. They then pour off the water and dry the animal in this position. We like to have several sets of "butterfly shells" and "false-teeth shells" of the chiton in our collection, and obtain these by boiling an animal till the plates or valves come apart easily.

It is interesting to preserve a few hermit crabs which have crawled out of their shells. They will do this if the sea water in which they are held becomes stale. Students are interested in the soft, twisted abdomen, particularly so if it is covered with bright coral colored eggs. Crabs of the species *Pugettia*, their bodies covered with algae and hydroids, also make interesting exhibits. We like to preserve some crabs by drying them after they have been in the preservative a few days.

The under-rock habitat harbors interesting dwellers.

Living animals are, of course, much more fascinating and we usually take a few back for a saltwater aquarium. It was not possible to do so this year for the weather was exceptionally warm and the animals would not have survived the trip back. In past years we have collected a very few of the smallest limpets and chitons, tiny sea anemones, small 6-rayed starfish, hermit crabs, and a mussel or two to which barnacles are attached. By placing each animal in a large container of cold sea water, the trip home was safely made. Sea water was also carried back to the classroom in gallon jugs and placed in a ten-gallon aquarium. We have been most successful when no sand or gravel was placed on the bottom and when only three or four organisms were used. If the student caretaker makes a daily check of the water level, and removes the uneaten food, the animals can be kept alive for several weeks. The difference in temperature and oxygen content of the water in the ocean and water in the classroom is so great that it is difficult to maintain a successful aquarium long.

Some students made individual aquaria in gallon jars, using tiny fish, very small shrimp, and minute hermit crabs. One girl improvised a plankton net and amused the other members of the class by swishing it through every tide pool she could reach. She had a very interesting sesison at the microscope the next day.

The final days of our unit were spent setting up a "How Many Do You Know" exhibit, using our newly mounted animals and some of the unlabeled specimens of our old collection. Attached to each animal was a number and several pertinent questions prepared by groups of students. The students moved about the room on a self-testing expedition, checked their answers with those on a key card, and were delighted to find they had learned so much.

Parents, students, and the teacher think the inclusion of a unit on Marine Biology is most worth-while. The young people have a different point of view in regard to conservation, they know how to care for the animals and plants which they do bring back from the beach; best of all, entire families have found that the study of seashore animals in their natural habitats is a new and fascinating pastime.

STUDY GUIDE ISSUED TO EACH STUDENT

SAFETY FIRST: Walk. Do not run over the rocks. *Ulva* is slippery. Always stay with your

partner. Look out for deep pools hidden by algae.

CONSERVATION: Replace every animal you observe unless you have permission to collect it. If you turn a rock over while looking for animals, put it back in its original position. Remember you have changed the habitat and some animals will not survive the change.

FIRST: Follow the tide out by going to the rocks over which the waves are breaking. On the tops of the rocks look for *mussels* and the means by which they are attached. As you try to pull one off look for the annelid, *Nereis,* and other *worms* living under the mussels. Can you find two kinds of *barnacles* living on these rocks or mussels? Watch those in a tide pool kicking food into their mouths with their feet.

On the sides of these rocks and in the cracks you should find: several kinds of *starfish; chitons* (look for a black one, a colorful lined one, a mossy one, and a giant red one); *plume worms; tube worms; sponges* (look for a red *sea slug* on a *red sponge*); *sea cucumbers;* yellow or spotted *sea slugs.*

Remove a starfish from the rock; put it on its back and watch it turn over. See if you can find a starfish at breakfast. What was it eating? Are all the starfish eating the same thing? Watch the tube feet. Look for starfish which are regenerating new arms.

Sea urchins are everywhere in little pockets in the rocks. Remove one from its hole. Hold it for a moment and see what hapens. Try to remove a *chiton* from the rocks and look for its mouth and tentacles (Remember you must take it by surprise!). Other animals just as hard to remove are the *limpets.* If you find a *keyhole limpet,* look on the underside near the shell for a *commensal scale worm.* Another limpet, the *dunce cap,* is covered with a hard coral-like alga which makes it hard to recognize.

Several kinds of snails live on these rocks. The largest is a *carnivorous snail* with leafy-like ridges on its shell. Examine its operculum. If you find any *purple snails,* look for their eggs which look like, and are often called, "*sea oats.*" Other snails to look for are: *turban snails; top snails; spire snails; olive snails; drills.*

In cracks and crevices, and under the mussels, you should find *Isopods* (sea-going pill bugs!), and *Amphipods* (they hop around like fleas).

Before you leave this low-tide area look toward the breakers and observe a seaweed called *Sea Palm.* How many other kinds of *kelp* do you find here? In the very deepest pools you may find some fragile *Red algae.*

SECOND: Now go shoreward from these rocks and find a quiet tide pool. Here you should find a large green *sea anemone.* Put your finger in its mouth. Try feeding another. Look around for other sea anemones. One is a large *red beaded anemone,* another is a *tiny pink one* with many little "baby" sea anemones around its base. These tiny ones live well in a salt water aquarium so if you find one on a rock that is easily removed you may take it back to the classroom. Do you find other kinds of anemones? Look for shrimp darting around in the tide pools. (Some will be green, some will have "bent backs"). Probe around in the sea weed for *kelp crabs.* Several kinds of fish make these pools their home. It won't be hard to find a *clingfish* slithering around on the darker sides of rocks or the *blenny eel* hiding under rocks. Sometimes you will see beautiful iridescent *sea slugs* "crawling" on top of the water. If you are lucky you may find an *octopus* as we did last year.

The most interesting starfish in this pool has *twenty rays* (or more), if it is mature. Immature forms have fewer arms. Don't be surprised when you pick it up to find that it feels soft and limp.

Plants grow in profusion in this area. Be sure you can identify the brown seaweed, *Fucus,* and the green seaweed, *Ulva,* sometimes called "sea lettuce."

THIRD: When the tide starts in study a little closer to shore. Walk up one of the rocky tide channels. Here you may find some of the same animals you found in the tide pools. This is a good place to turn over rocks and look for several kinds of *crabs, brittle starfish, six-ray starfish, tube worms,* and *peanut worms.* You may even find some *clams* nestled in the rocks. A little closer to shore look for the *purple shore crab* and a baby *octopus.* On the sand-covered rocks near the north end of the beach you will find eel-grass and some forms of algae growing. Pull up these plants and look on their roots or holdfasts for brittle starfish and peanut worms. In a tide pool close to shore hunt for *hermit crabs.* How many different kinds of shells do you find them carrying around? Can you get any crabs to leave their shells?

On the rocks of the "splash zone" near high tide line look for *limpets,* tiny *snails,* and small *barnacles.*

Before you leave the beach see how many different kinds of algae you can collect. **DO NOT LEAVE THE "MARINE GARDENS" WITHOUT PERMISSION.**

SELECTED REFERENCE BOOKS FOR THE UNIT

Beebe, William L. *Half Mile Down,* Harcourt, Brace, and Co.; *Arcturus Adventure* and *Beneath Tropic Seas,* G. P. Putnam's Sons.

Buchsbaum, Ralph. *Animals Without Backbones,* Univ. of Chicago Press.

Carson, Rachel. *The Sea Around Us,* and *Under The Sea Wind,* Oxford Univ. Press.

Flatteley, F. W., and Walton, C. L. *The Biology of the Seashore,* The Macmillan Co.

Guberlet, Muriel L. *Animals of the Seashore,* Metropolitan Press; *Seashore Parade,* Jaques Cattel Press.

Hesselberg, Erick. *Kon-Tiki and I,* Rand McNally and Co.

Heyerdahl, Thor. *Kon-Tiki,* Rand McNally and Co.

Hylander, C. J. *Sea and Shore,* The Macmillan Co.

Johnson, Myrtle E. and Snook, Harry J. *Seashore Animals of the Pacific Coast*, The Macmillan Co.
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Biology For The General Pupil

CHARLES TANZER, Seward Park High School, New York, N. Y.
LOUIS EISMAN, Andrew Jackson High School, St. Albans, N. Y.

Editor's Note: This challenging article is an abstract of a talk presented by the authors before The 1953 National Convention of The National Ass'n of Biology Teachers at Boston, Mass., Dec. 27–31.

One of the most pressing problems facing the biology teacher today is the marked change in the type of pupil he is asked to teach. A teacher who fails to recognize the existence of this new type of pupil, or who is reluctant to modify his course of study and his teaching methods, faces bitter frustration. The obvious fact is that the time-honored emphasis on scholarship for its own sake is no longer effective in a majority of our biology classrooms. A brief review of the facts may be enlightening.

HIGH SCHOOL GROWTH

The high schools of our country have experienced continuous growth of an unprecedented nature. In 1890, only 357,813 pupils were enrolled in the high schools of the nation. Today the number exceeds 7,000,000. This represents an increase of 1,643 percent over the 1890 enrollment. 75% of all 14- to 17-year-olds are in high school. Such extensive growth affects all high school teachers. In 1890, high school pupils were concerned chiefly with college preparatory work. This endeavor was reflected in the high intellectual level of the student body. In recent times, however, it has become evident that the majority (80% or more) are not college-bound. The high schools of today accept all youth and are no longer selective. This trend has been accelerated by the policy of "social promotion" in the elementary schools. We are now admitting pupils of low intellectual capacity: pupils who cannot read with noticeable facility; pupils who come from underprivileged homes, as well as from favored homes; pupils who are preparing for college, as well as those who are straining to leave as soon as they may legally do so.

PUPIL MENTAL ABILITIES

One of the most striking features of the modern student body is the wide range of mental abilities. What does it mean to teach a biology class in which mental ages range from a low of nine years to a high of 20? If we concentrate on the average group alone, we may find superior pupils developing into accomplished loafers, while the poorest pupils fall behind and develop into disciplinary problems.

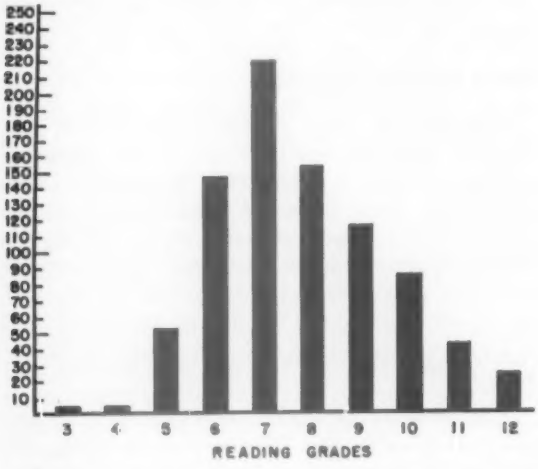
The authors surveyed an entering freshman class in a large city high school in 1952. Of 643 pupils who had reached the chronological age of 14 years, *30% were retarded mentally from one to five years!* The distribution is shown in the graph below:

The large number of below-average pupils need not surprise us. A study made in rural areas in 1936 indicated that 48% of pupils entering a high school were retarded one or more years mentally. Our study was made in

a relatively privileged area. The parents of almost all of the pupils surveyed were upper middle-class home owners. It is likely that surveys made in more depressed areas of a large city would yield an even greater percentage of retardation. The point is that at least one out of every three pupils in our classes is mentally retarded.

PUPIL READING ABILITIES

A second striking feature of our present-day pupil population is the wide range of reading abilities. A survey of 834 freshmen in the same large city high school, the same group of entering as in the previous graph, in Oct. 1952, indicated that *more than 50% were retarded one or more years in reading ability!* The results shown in the graph below are based on a norm of 8.0 to 8.9:



Reports in educational journals and in the press indicate that reading retardation is a very widespread problem in all parts of the United States. To what extent can such pupils complete the usual written assignment? Can their interest be aroused by giving them the details of osmosis, conjugation, mitosis, or the dihybrid cross? Can these pupils successfully cope with the traditional course in academic biology?

THE DROPOUT PROBLEM

Less than half of the pupils in the entering class of an average high school will finally graduate from that school. This has been interpreted as a result of our failure to recognize the wide differences in abilities and to do something about them. It seems to be clear that verbal and abstract learnings have been rejected by many thousands of adolescents. Failing grades and lack of interest in high school subjects have been given as the chief reasons for dropping out of school. The so-called *general* pupil, for whom high school is the terminal agency of formal education, will not fall in line with activities designed for the more ambitious.

FUNCTIONAL BIOLOGY COURSES

Fortunately, surveys of biology courses throughout the country indicate that biology teachers have been quick to modify their courses to meet new situations as they develop. Most courses today are based on principles, rather than on the specialized treatment of botany and zoology commonly taught in previous years. But have we gone far enough in developing materials that will appeal to the general pupil? In some parts of New York State there is already a strong trend away from biology, since many pupils feel that they cannot cope with the standard course.

New York State's Regents Advisory Council on Readjustment in High School Education has recommended that "teaching techniques, materials and equipment be adapted to pupils of differing abilities, interests and backgrounds, so that each pupil is accepted as a person possessing a normal yearning for recognition, new experiences, achievement, and security." In response to this need, a State Committee has been appointed to develop a new course in biology for the general pupil.

For the past 15 years, committees have been at work in New York City constructing units of work for general pupils in biology classes. Teachers having particular experience with this problem taught the units in their classes and suggested modifications and deletions. An organized course of study finally emerged, published as *Curriculum Bulletin Number 1: GENERAL BIOLOGY, 10th Year,* New York City Board of Education.

How does the new course of study differ from the usual Regents Course? It is intensely practical and functional. Technical vocabulary is held to the absolute minimum and abstract generalizations have been entirely eliminated. But the committee attempted to preserve the major values of biology and to emphasize the dynamic nature of the course. Flexibility is the keynote of the course. The units are planned as resource

units, and the teacher may select those materials of particular interest to his class. No unit is mandated. In fact, teachers of slow classes often teach only two or three of the nine units in the course of a year's work.

What kind of material is taught in these units? In the unit on Behavior, the pupils learn about their own reflexes and their importance, about the role of conditioning in implanting fears, about the meaning of IQ and the need for good study habits, and about typical behavior problems of adolescents. The unit on Heredity deals almost entirely with human heredity and omits the complexities of the subject. The unit on disease emphasizes the need for proper personal health habits and the significance of public health measures. Throughout, stress is laid on information of primary importance in the daily life of the pupil.

The response of the general pupil to this type of material has been very satisfying. Interest has been at a high level and the usual symptoms of sullen withdrawal from the activities of the class are rarely encountered. The general student likes biology, but he must have the proper kind of course. It is useless to try to force him to assimilate academic concepts. He will reject them in no uncertain terms. The general pupil can be taught if he is taught a functional biology course.

METHODOLOGY

In large schools, it is possible to set up classes composed solely of general pupils. Selection may be made on the basis of IQ, reading grade, teacher recommendation, previous scholastic record, or combinations of these factors. In smaller schools, it may be necessary to arrange for differentiated assignments within the class. When such arrangements are made tactfully, no stigma is attached to pupils who are enrolled in general classes. They enjoy doing work adapted to their abilities and interests without competition from pupils who are more inclined toward academic skills.

Given a well-thought-out course of study and a sympathetic teacher, the next consideration is the planning of suitable classroom procedures for special situations. The usual recitation procedures have not been successful with the general pupil. Their attention span tends to be relatively short, and they require a variety of experiences in a single class period. The general pupil needs very specific direction. He wants to know exactly where he is heading. Vague assignments, difficult individual reports, advanced reading, and technical discussion are not for him. On the other hand, he will strive to complete a concrete task in which he is actually interested, and he will often do an outstandingly good job when properly stimulated.

A major portion of the class time should be devoted to directed reading. The biology teacher has a fine opportunity to help in the correction of reading disabilities through the medium of reading material in which the pupils are vitally interested. Pupils should be guided in their reading by providing them with a series of simple yet searching questions based directly upon the assigned reading matter. The assigned questions may be discussed by the entire class, and the teacher may bring in charts, models, living materials, and other aids to illustrate and extend the discussion. Visual aids are particularly effective with this group of pupils, but they must be carefully previewed to exclude materials of a very difficult or non-functional type.

General pupils enjoy individual experiments, demonstrations, and projects. They often do a superlative job when they really become interested in a topic. Such pupils should be held to standards of a realistic nature. They should be required to keep good notebooks, and many of them take great pride in taking accurate notes and in making fine drawings. The testing program should include frequent "open book tests" as well as simple essay and objective type examinations. It is advisable to rate pupils on the basis of effort and to encourage each to work to capacity.

DISCIPLINE PROBLEMS

Pavlov had a dog to whom he always showed a circular patch of light before offering food, and an elliptical patch preceding an electric shock. The dog soon became conditioned and reacted in the expected manner to each of the two stimuli. Pavlov then gradually changed the shape of the ellipse, making it more and more like a circle. Finally, a point was reached where the dog could not successfully distinguish between the two figures. He responded with howls and uncontrollable struggles.

It is no secret that disciplinary difficulties tend to be concentrated among the slower learners, and Pavlov's experiment may furnish a partial explanation. When faced with

problems beyond their comprehension, general pupils may not respond with howls and struggles, but they often show bursts of unsocial behavior. It is evident that when they are given work of an interesting nature, geared to their ability level, a major source of difficulty is removed. The sympathetic teacher will use praise frequently and censure never. While pupils should be required to work to capacity, they should not be expected to achieve beyond their capabilities. Teachers of general classes commonly find that individuals, who have a history of inability to conform in academic classes, adjust themselves without difficulty in a more congenial environment.

RESPONSIBILITY AND OPPORTUNITY

Many biology teachers resent the presence of the general pupil in their classes. They argue that a course of study for such students based upon practical values and simplified method is a watered down course with debased standards of achievement. But we have passed the era when learning was only for the intellectually elite. Biology teachers must present the acknowledged values of their subject to all pupils, regardless of their innate abilities. The biology teacher must be alert to the requirements of every pupil in his class.

The general biology course meets a challenge which all teachers must face in the climate of today's schools. Experience has shown that the vast majority of general pupils are eager to learn and that they can be taught successfully if exposed to suitable experiences in the proper way. Here is a fertile field of endeavor for the resourceful biology teacher. Let us make biology a rewarding experience for *every* pupil.

MAKING A "DIAMETER TAPE"

The purpose of the "diameter tape" is to get an accurate diameter measurement of a tree without cutting the tree down. These tapes and a logging scale are used by biology pupils of our school to determine the number of board feet of lumber in a tree.

The "diameter tape" is easily made. The materials needed are two old tape measures and a roll of bias tape. Sew the two tape measures together, end to end. Then sew the bias tape on the back side of the measuring tape. Now place marks $3\frac{1}{4}$" apart with permanent ink on the bias tape, starting at the 0 mark on the measuring tape; each mark on the bias tape will now represent 1" of tree diameter.

The largest tree on our school grounds is an elm. It is 135" in circumference and $41\frac{1}{2}$" in diameter. A 16 ft. log at the base of this tree is estimated to contain about 800 board feet of lumber.

Here the "diameter tape" is shown in use.

This and other pupil-made devices are encouraging more pupils of our school to go deeper into the study of forestry conservation.

See "More Activities by the Pupils," *The American Biology Teacher*, Feb. 1953, Volume 15, No. 2.

HAL ARNTZEN,
Student of S. M. PATTEE,
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Cedar Rapids, Ia.

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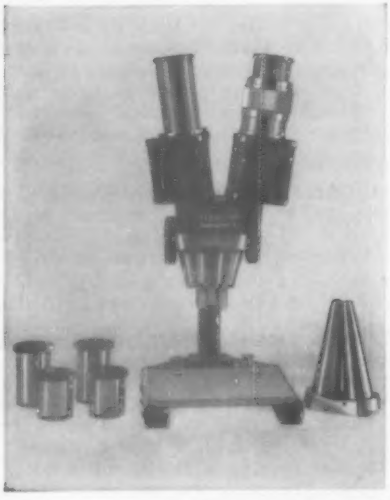

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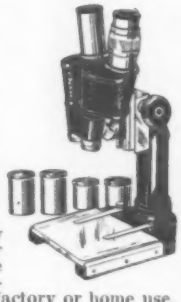

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Do Biology Teachers Use Live Materials?

CYRIL E. ABBOTT, Evanston, Illinois

In order to determine the relative demand for commercial products by high schools in biological studies, a simple inquiry was sent to over 100 schools throughout the United States. This included some in every state.

Although no effort was made at classification, selection was restricted to those institutions having not less than 200 students and, in a very few cases, schools of over 2000. About equal numbers of urban and rural schools were surveyed. Selection was made at random from the Directory of Secondary Schools in the U. S., Circular 250, Federal Security Agency.

Double postal cards were used. Five items were listed: ( ) Charts; ( ) Living organisms; ( ) Specimens preserved in bulk; e.g., for individual student use; ( ) Permanent demonstration preparations, including skeletons; ( ) Prepared microscope slides. The recipient was requested to rate the listed items according to order of use; i.e., that most used to be indicated by 1, that next in order of use 2, etc.

Of the 120 cards sent out, over 50 were returned. Of these, several were improperly or incorrectly marked. There remained 45 usable returns.

The data was distributed as indicated in Table I.

TABLE I

Order of Use of Materials in High School Biology

Order	Charts	Living organisms	Bulk specimens	Permanent preparations	Microscope slides
I	16	6	15	13	6
II	13	12	8	6	11
III	8	3	11	9	15
IV	6	12	6	11	6
V	4	14	7	9	8

In evaluating the data, the middle category (III in Table I), was regarded as zero. In each vertical column the sum of the numbers in IV and V was subtracted from the sum of those in I and II. Since three of the resulting numbers were negative, a temporary graph was constructed using a zero abcissa with a parallel base line sixteen points below. Positive and negative numbers were pointed from the zero line, but columns graphed from the base line. In constructing the final graph, items were arranged in descending order of use and the columns erected as percentages of the total number (95) of cases.

Editor's Note: The author, with an unusually wide background in high school and university biology teaching, turns his attention to the problem of whether or not biology still emphasizes the *bios*. His graduate work was done in entomology at Kansas State and Ohio State. He has also done work in the commercial and governmental programs in science.

TABLE II

Order of Use of Biological Materials by High Schools

%	Materials
35%	Charts
24%	Bulk specimens
16%	Demonstration preparations
12%	Microscope slides
8%	Living organisms

Comment on the results, as indicated by Table II, is hardly necessary. It is evident that, as a whole, biology teachers lean heavily upon charts and "pickled" specimens, with a moderate use of permanent mounts. Microscope slides fall somewhat below this, and living organisms are scarcely used.

Many high school students, then, do not in their biology courses deal very directly with life itself. There are some obvious and more obscure reasons for this. Until a thorough survey of the subject is made we shall have no exact knowledge of their relative importance, nor will we know just what remedies to apply.

Embryological Studies for the High School Biologist

MARK L. MENZEL, Premedical Student, Univ. of Michigan, Ann Arbor, Mich.

Embryology is one of the most fascinating fields of biology. In order to capture a full understanding of the subject, it is necessary to carry on experiments. These are easily conducted with the equipment found in the average high school laboratory, or with the purchase of a very few instruments for a home laboratory. I first became interested in embryology in an elementary biology class when several students did an extra-credit experiment by incubating chicken eggs. We used a school-owned incubator, and made charts and drawings of the developing embryos. Two years later the local American Chemical Society sponsored a Science Fair; I developed new interest, and began to plan a display. I placed chicken eggs [1] in a homemade incubator (Fig. 1) one month prior to the opening day of the Fair. The incubator was made of wood; it measured 18″ in length, 15″ in width, and 10″ in depth. Air holes were drilled near the bottom to insure good ventilation. Two light bulbs (60 watt) were attached to a micro-switch, regulated by a thermostat. The lights went on and off about every 15 seconds, and kept the temperature nearly constant.

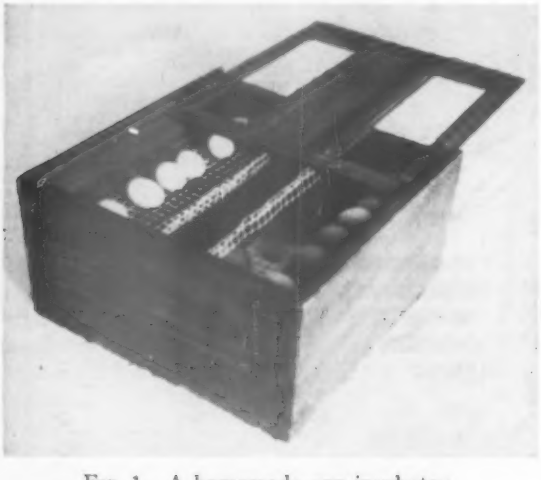

FIG. 1. A homemade egg incubator.

Editor's Note: These experiments were carried out by the author while a student at Midland High School, Midland, Mich., under the direction of John P. Harrold.

A ½″ wire mesh tray was constructed about 2″ from the top, so that it could be removed with all the eggs. The top, which slid into grooves in each side of the box, had two glass windows about 3″ wide and nearly the length of the top. These windows fitted into grooves in the top and could slide easily.

Before the eggs were placed in the incubator, a cotton swab soaked in 95% alcohol was used to clean the upper surface of the egg. With a sterile, sharp scalpel, a small incision was made through the egg shell. Care had to be taken not to invade the delicate membranes under the shell until all shell fragments had been removed. The shell was removed with sterile forceps until a hole about ¾″ in diameter was made. The opening was made in a circle designated by the position of the germinal spot, located by candling. With the egg on the candler, the blastoderm was located, and its position marked with a pencil on the shell above. The egg, in exactly the same position, was placed in a bed of cotton where it was rigid and yet could be easily manipulated. The shell membrane was then cut away until the white blastoderm was visible. The entire procedure had to be conducted meticulously to avoid contamination. All precautions to insure sterility had to be taken. The work was done in a place free from any sort of draft which might aid contamination.

The hole in the shell and membrane was covered and sealed air-tight. The method used to put the observation window over the hole was, first, to secure a previously sterilized coverglass, large enough to cover the aperture. With a pipette, *sodium silicate* (available at any pharmacy) was spread in a ring around

[1] **Store eggs are a risk, as they are likely not to be fertile. The eggs should be purchased from a farm, or a hatchery, in order that fertility can be assured. Candling is a method of determining fertility. This consists of placing the egg over a strong light showing through a 1″ hole drilled in the top of a box. If a small dark spot can be seen on the yolk, indicating the presence of the blastoderm, the egg is fertile.**

the opening until it allowed the cover glass to set evenly and level on all sides, leaving no air spaces. If difficulty was encountered in elevating a portion of the ring, cotton was rolled in a circle, forming a base for the cover-glass. The whole stratification was sealed with the *sodium silicate* by applying it to the outer edges.

The eggs were returned to the incubator and the entire development of the embryo until hatching time was observed. Correct incubating temperature is very important, particularly during the first week of incubation. The initial temperature was 101½–102° F. for the first week, 102–102½° F. the second week. and 103° F. the third week, but never allowed to exceed 104° F. The mortality rate is high,[2] but this does not connote that the specimen is lost. If the embryo died after having been incubated for less than four days, slides for microscopic study were made. Embryos over four days old were preserved in formaldehyde. These specimens helped make a complete and interesting display.

The eggs were set in such a manner that, on the day of the Fair, chicks in all stages could be displayed. Week-old chicks add life to an otherwise inanimate display. They may stimulate people to view the rest of the exhibit.

The embryos of less than nine days can be studied readily through the observation window, but older specimens are so far developed that very little can be seen. Due to the fact that this later development is probably the most interesting, I wanted everyone to see it. I warmed a sterile Petri dish, and carefully broke the egg into the dish. All of the membrances were separated from the shell without much difficulty, but extreme care was taken not to injure the delicate blood vessels.

The Petri dish was placed in the incubator, and the embryo remained alive from two to four hours. Peristaltic movement, resembling breathing, could easily be observed. To add to the display, I showed preserved chick embryos of all stages, and set up microscopes with slides showing very early development. A wax model of an egg was also exhibited, showing membranes, yolk, blastoderm, chalaza, and their relationship to one another.

To increase a true understanding of embryology, this type of experiment can be carried out by any high school student, and can be of unlimited interest and benefit to all concerned.

[2] This can be accounted for in several ways: (1) the eggs cannot be properly turned (the egg may be rotated somewhat after 24 hours of incubation, but the embryo and its membranes should be kept away from the window); (2) it is difficult to keep humidity constant; and (3) the opening in the egg leaves a possible avenue for invasion by bacteria and viruses.

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Biology Class Prepares Red Cross Exhibit

The extension of classroom instruction into the activities of everyday community life is a desirable goal for biology teachers. Activities of The Red Cross affect most people. Preparing an exhibit for the local Red Cross Chapter gave biology and chemistry pupils at Phillips High School, Battleboro, N. Carolina an opportunity to use their science training in an act of good citizenship. After the exhibit

Background: Blood types reactions showing red blood cell agglutinogens, serum agglutinins, agglutination reactions, practical transfusions, and universal donor. Cell agglutinogen in red; serum agglutinin in black; yes, red; no, black. *Foreground:* Skeleton of cat, with natural ligaments; skeleton-viscera; central nervous system of cat, ventral and dorsal views. Central nervous system display has brain, optic nerves, and spine in natural positions.

was shown, the Blood Type Reaction visual aid became the property of The Red Cross, and school specimens were returned.

MARCELLUS C. MILLER,
Phillips High School,
Battleboro, N. C.

Biology in New England State Teacher Training Institutions[1]

FRANK J. HILFERTY, State Teachers College, Salem, Massachusetts

Seldom is the value of biology to the college student disputed in academic circles, but preparation of biology instructors, emphases, and methods of teaching are rather unsettled issues. While we do not anticipate, nor perhaps even wish for, a rigid standardization in these matters, a modicum of agreement as to what constitutes essential material and how our objectives can be achieved in the most efficient manner seems desirable. Biology courses, faculties, and facilities, as well as administration and general conditions in 23 New England state teacher training institutions, were studied. In securing data the following devices were used: survey of pertinent literature, personal correspondence, and personal interviews with administrators and biology faculty members. Material on graduates' opinions of their biology course was obtained exclusively by a mailed questionnaire. Our findings are given below.

Administration. The course is usually jointly administered by the college president and the instructor of biology with the president hiring new faculty members. Most administrators prefer to hire instructors who have had experience in both teaching and research. They are interested in a candidate's personality, ability to get along with other people, scholarship, training, and character. The majority consider a master's degree and a major in biology as minimum preparation.

Biology Faculties. Most instructors did not receive their education in a teachers' college. Apparently there has been no set pattern of preparation, as a great variety of faculty majors and minors were found. 85% have the master's degree and 23% hold the doctorate. Before entering teachers' college work, most instructors taught in elementary or secondary schools. The greater number participate in extracurricular work and belong to at least one professional organization. Teaching and studying are the principal summer occupations, while photography and natural history lead as hobbies of the group. The majority of instructors have never taken a sabbatical leave, and only 35% have published articles. In general, with certain notable exceptions, the writer considers the group poorly trained and rather unaware of its paucity of knowledge in the field of biology.

With respect to teaching loads, biology instructors usually have more teaching hours than other faculty members. All instructors surveyed teach at least one course in addition to general biology, and a total of 31 different courses are taught by the group. Although most instructors seem quite content with their positions, it is significant that they list almost twice as many disadvantages as advantages in teaching biology at a state teachers' college. In giving advice to potential teachers' college biology instructors, the faculty members recommend building a good background in biology, attendance at a recognized college of arts and sciences, and a Ph.D. The three most valuable non-academic experiences suggested for prospective instructors are insect collecting, plant collecting, and farming.

The Course. 15 of the schools require biology for all students, and eight omit it from certain curricula. Biology is usually offered in the freshman year and is a terminal course for most students. The majority of instructors do not consider prerequisite courses necessary. An average of 1.9 semesters is devoted to the course, with an average of 1.9 laboratory periods and 2.3 lecture hours per week. Lecturing is the most popular method of presenting material. Almost half of the instructors invite visiting lecturers to address their classes. Among the most frequently used sensory aids devices are: field trips; drawings; preserved plant and animal materials; slides; microprojectors; sound motion pictures; film strips; opaque projectors; recordings. Practically all of the schools have access to a radio broadcasting station, but only three institutions used this medium to sponsor science programs.

Principal course objectives are teaching general biological principles and showing relationships between biology and daily living. Over 50% of the instructors build the course around their notes. The greatest amount of

[1] Based on a thesis submitted to the faculty of the Graduate School, Cornell University, for the Ph.D. Degree.

time is given to plant anatomy and physiology. Most instructors prefer a single biology text to a combination of botany and zoology texts. Mavor's *General Biology* is the most popular text, while Buchsbaum's *Animals Without Backbones* and Palmer's *Fieldbook of Natural History* are the principal reference books. *Nature Magazine* leads the list of periodicals used in connection with biology. The majority of instructors assign definite readings in the text, reference books, and periodicals. Most teachers use a combination of objective and subjective examinations. The general frequency of examining is a test once each month and a semester examination. In general, the instructors are not satisfied with their courses and are trying to improve them. Lack of time is their chief criticism of the course in general biology.

The Laboratories. Six schools have no laboratories, and many of the colleges have inadequate laboratory facilities. The average value of equipment is $6,045 with a range of $1,000 to $25,000. Only three schools charge a laboratory fee. There is a general feeling of dissatisfaction with the laboratories, and the following changes are suggested: installation of gas and electricity at student tables; more microscopes; microscope lamps; student assistants; more working space.

The Libraries. All schools have libraries of the general type. The average number of biology books is 703, with a maximum of 2,500 and a minimum of 29. Periodicals average 11, with a maximum and minimum of 20 and one respectively. Collections of reprints and pamphlets in most cases do not appear to be very functional. The average number of these items is 701, with a maximum of 5,000 and a minimum of 7. Only six schools have film libraries. The average number of biology films is 20, with a maximum of 26 and a minimum of one.

Graduates' Opinions. Of the graduates polled, less than half report some professionalization of the subject matter. The majority find the course helpful to them in daily living and teaching, and most think the course is suitable for the preparation of teachers. The most useful topics are: plant life; animals; bird identification and study; human biology; heredity; human anatomy; conservation. The least useful topics are: classification; microscopic forms; insects; invertebrates. In general, the graduates have not taken additional biology courses. A few report taking some required courses in biological science, and less than one-third have elected such courses.

The greater percentage of criticism is unfavorable, with the following items most frequently mentioned; not enough field work; inadequate laboratory facilities; not enough laboratory work. Excellent teaching and good laboratories lead the list of favorable comments.

Summary of Findings. While excellent work is being carried on in a few of the New England schools, the writer has come to the general conclusion that the introductory biology course in this area is rather unsatisfactory. Some possible reasons for this unfortunate situation are offered: inadequate equipment and laboratory facilities; lack of sufficient funds; paucity of biological literature; poorly trained instructors; lethargy, lack of vision, and timidity of instructors; watering down of course content as a result of pressure from inadequately trained instructors and certain educationists; overloading of biology faculty programs.

Recommendations. With a view toward the improvement of general biology in the New England state teacher training institutions, the writer, as a result of this investigation and in the light of his professional experience, recommends:

Administrative. 1. That laboratory fees be established in all schools. *2.* That administrators provide adequate student help in the laboratories. *3.* That teaching and extra-curricular loads be reduced and laboratory hours be given the same value as lecture hours in computing teaching loads.

Staff. 1. That functional collections of local plants and animals be organized so that students may become acquainted with the major groups and common species of native organisms. *2.* That faculty members attempt to cultivate at least one hobby related to the field of biology. *3.* That the several biology faculties of the teachers' colleges plan a series of meetings to work on the formulation of specific objectives for general biology, the designing of suitable experiences to achieve the objectives, and the construction of evaluating devices to measure the degree of progress made by students in the course.

Administrative and Staff. 1. That state directors of teachers' colleges, administrators, and biology faculties inaugurate a program whereby a properly trained faculty with adequate and appropriate experience can be re-

cruited and retained. *2.* That administrators consult with professors of biology before hiring new biology instructors. *3.* That field facilities such as forests, agricultural lands, ponds, and streams be purchased by the schools for the development of outdoor laboratories. *4.* That the influence of the college be extended in matters of conservation, health, science education, and other biological areas through the production of radio programs, television programs, and the writing of pamphlets for the guidance of public school teachers and students. *5.* That faculty members be encouraged to write textbooks and laboratory manuals for biology students at the teachers' college level, and that recognition for research and publication be given in terms of academic and economic advancement. *6.* That adequate film libraries be established and a greater effort be made to acquire other sensory aids materials which would increase the effectiveness of instruction. *7.* That laboratory facilities be expanded and improved to the extent that more space is made available, each student has access to a microscope, and laboratories are used exclusively by classes in biological science. *8.* That the number of courses offered in the biological sciences be increased, and that summer courses in field biology be offered to teachers in the public schools. *9.* That libraries increase the number of reference books, periodicals, pamphlets, and reprints of articles on biological matters. *10.* That present members of biology faculties lacking adequate training be required to take definite steps, under the direction of university professors of biological science and science education, toward the improvement of their backgrounds. *11.* That the following undergraduate and graduate courses be considered reasonably adequate preparation for the teaching of biology at the teachers' college level:

Botany: Bacteriology, forestry, general botany, plant anatomy, plant physiology, and plant taxonomy.

Education: Educational psychology, philosophy and history of education, practice teaching, science education, and sensory aids.

English: Composition and grammar, journalism, literature, and public speaking.

Foreign Languages: French, German, and Latin.

General Biological Science: Conservation, ecology, field natural history, general biology, genetics, health, paleontology, and psychology.

Mathematics: Algebra and statistics.

Physical Sciences: Biochemistry, general chemistry, general physics, geology, meteorology, organic chemistry, and soils.

Social Sciences: American history and government, economics, geography, sociology, and survey of civilization.

Zoology: Anthropology, comparative anatomy, embryology, entomology, general zoology, histology, invertebrate zoology, physiology, and vertebrate zoology.

Miscellaneous: Illustration, literature of science, philosophy, photography, radio broadcasting, and religion.

Across The Editor's Desk

A conference on "The Place of the High School in Meeting Current and Future Scientific Manpower Needs in the United States" was held recently at Columbia University under the direction of **Dr. F. L. Fitzpatrick.** Other speakers were: **Dr. H. A. Meyerhoff; Dr. E. Ginzberg; Dr. F. Bowles; Dr. N. Shepard.** Dr. Fitzpatrick says, "Recent surveys indicate an acute shortage of well-trained scientific personnel, and future prospects are not reassuring. To some extent, this is related to economic causes, but more commonly has its origins in poor school programs for attracting and preparing young people for careers in science. He contends that: (1) many high school science courses are out-of-date in content and methods, and need to be revised; (2) science programs in smaller schools are inadequate in equipment, variety of courses offered, and in teacher competence; (3) of the 60,000 high school science teachers throughout the country, more than half teach science on a part-time basis and the majority, who can teach other subjects, are only "filling-in"; (4) the education of science teachers needs national changes, not only in preparing new teachers but especially in helping experienced teachers to keep up with advances in science and in teaching methods. Dr. Fitzpatrick says, in conclusion, **"The problem of how to alert science teachers to this situation, and give them opportunities to improve, is crucial."**

A 10 min., 16 mm., sound film in color, "It's Only Beginning," tells the story of industrial research and its contribution to the ultimate consumer and is available on a **free loan basis** from Scientific Apparatus Makers' Ass'n, 20 N. Wacker Dr., Chicago 6, Ill.

The American Dental Ass'n has produced convincing evidence that **great hazards to dental**

health result from heavy consumption of sugar in the United States. The evidence includes sweetened and soft drinks. The Association recommends that the sale of sweetened beverages and confections in schools be stopped as a direct help toward improving dental health of school children.

National Teacher Examinations will be given at 200 centers throughout the United States on Saturday, Feb. 13, 1954. Application forms and a bulletin of information, describing registration procedures and containing sample test questions, may be obtained from college officials, school superintendents, or directly from Educational Testing Service, Box 592, Princeton, N. J.

Worth quoting to your students: "It is technology that gives the extra things that count. Industrial technology provides the extra food on the table, the extra mile on the speedometer, the extra dollar in the wallet. It is the extra bushel in the barn, the extra suit in the closet, the extra diploma at commencement time. It is the extra hours of leisure, the extra years of health and life, the extra measure of security. We have now opened up a whole new stage for our national development, a stage on which the elements of the land and the people are augmented by a third dimension—the dimension of science . . . ." Excerpt from speech by **Henry B. du Pont** before Kinston, N. Carolina Chamber of Commerce.

The Illinois Society for Medical Research announces a contest restricted to high school students. Essays of 250 words on the topic, "Animal Experiments and My Health," may be submitted before midnight, March 30, to **Dr. N. R. Brewer,** 951 E. 58th St., Chicago 37, Ill. First prize is $25.00; second, $15.00; third, $5.00. Further information may be had from Dr. Brewer, **Dr. J. M. Sanders,** 6800 Stewart Ave., Chicago 21, Ill., or Nat'l Society for Medical Research, 208 N. Wells St., Shicago 6, Ill.

Dr. Earl R. Glenn, Fulbright Prof. of Educ. Research, will spend another year at Central Philippines University in Iloilo, one of the central islands. CPU specializes in elementary education, and Dr. Glenn assists teachers in defining investigations for M.A. Degrees. Greetings and best wishes, Dr. Glenn.

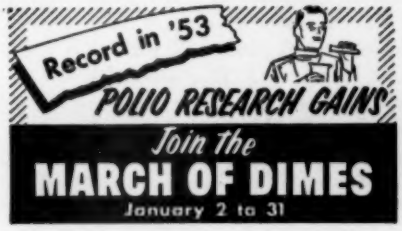
Who said this, and when? **"Nothing can better deserve your patronage than the promotion of science."** George Washington (1790)

Bro. H. Charles, St. Mary's College, Winona, Minn., contributor of *Biology In The News* and aggressive NABT and Editorial Staff Member, suggests that we should have "a book listing each especially active NABT member with personal data and a short summary of the activities and interests of each" for the guidance of new officers and Committee Chairmen. Send him your suggestions on this idea. **Would someone volunteer to compile such "a book"?**

American Cyanamid reports that the new antibiotic drug, **"tetracycline,"** is now on the market. The development of this new antibiotic is one of the most fascinating stories in the annals of modern medicine.

Just reported—through an error in hold-over copy for the Oct. 1953 issue, from the previous editorship, a letter printed at the bottom of Page 162 of that issue was from **Sister Mary Alverna** instead of Sister Mary Aquina.

Oxytocin, a hormone of the body's "master gland," the pituitary, **has been produced synthetically** by a team of biochemists led by **Dr. Vincent du Vigneaud,** Prof. of Biochemistry, Cornell Univ. Medical College. This is the first of the pituitary gland's vital secretions, which include ACTH, to be produced in the test tube, and the first polypeptid hormone to be produced synthetically. Oxytocin is the chief uterine-contracting and milk-releasing hormone of the pituitary gland. The synthetic product has the same physical and chemical properties as the natural compound, and demonstrates the same biological effects in experimental animals and clinical use.



Polio research made great gains in 1953. Don't forget The March of Dimes, Jan. 2–31.

If you could not attend NABT's thrilling Annual Convention at Boston, plan now for 1954.

NABT was ably represented at the "Resources for the Future" conference in Washington, D. C. Dec. 2–4 by **Weaver, Hadsall, Jeffers,** and **Palmer.** Plans were laid for joint action with other professional groups.

A new high honor and responsibility has been conferred on our versatile Mg. Editor, **Muriel Beuschlein,** recently chosen Chairman of a Local Area Conservation Study Project approved by The Steering Committee of the Illinois Curriculum Study group. **Dick Weaver,** Project Leader of NABT's Conservation Project, working with Illinois Chairman **Bob Smith** and Regional Chairman and NABT Pres. **Art Baker,** interested this group through preliminary meetings started last January. Congrats to Muriel, Dick, Bob, and Art for another major contribution.

You should read the complimentary letters that cross my desk each week on recent Journal improvements. Thanks to all of **you** who helped make these possible. **Let's move aggressively ahead to make ABT the top-ranking publication in its field!**

Dear Editor Vance:

Stealing time to . . . skim the cream (of which there was a thick layer) from the most recent issue of our Journal just at hand . . . . Please do not discontinue "The Old Fossil" column. I enjoy and profit from this greatly. Please continue your alert practices which are making ABT the stimulating journal we need . . . . We are moving ahead and abreast of the times . . . . We must create the desire on the part of teachers to pick up every issue and look it over. . . . We cannot fail to interest the teacher with our present jam-packed utility. Nelson's "Opportunities . . ." will be worth its weight in gold with my students. . . . Keep on personalizing the Journal. The new Ward's Bulletins are excellent. . . . We are moving ahead! I just had to stop and tell you so.

CHARLES E. PACKARD,
Assoc. Prof. of Biology,
Randolph-Macon College

Index for Volume 15

Annual Convention Program for 1953, 210
Abbott, Cyril E., *Caracoles at Vinales*, 49
Across The Editor's Desk, 160, 183, 216
Activities by the Pupils of S. M. Pattee, 29
Agersborg, Helmer P. K., *The Importance of Comparative Histology in Education*, 69
Animals and Why Children Fear Them, John D. Woolever, 122
Association Officers and Editorial Staff, 192
Baker, Arthur J., *So This Is an "Air Fern"?* 101; *The Open Road to Education For Family Living*, 62
Baker, Howard, *Enzymatic Aid for Euglena*, 154
Barrows, E. F., *Food-Chain Culture of Daphnia*, 149
Benton, Allen H., *The Use of Balsa Wood in the Preparation of Skins of Small Mammals*, 148
Beuschlein, Muriel, *Free and Inexpensive Materials for Conservation Education*, 35
Biggs, Norman L., *Photomicrographs as a Laboratory Teaching Aid in the Biological Sciences*, 201
Biology Clubs as Teaching Tools, Robert L. Smith, 186
Biology in The News, 17, 21, 54, 111, 134, 167, 193
Biology Laboratories, M. C. Lichtenwalter, 110, 165, 188, 218
Books Reviewed
Chester, K. Starr, *Variation, Immunity, and Breeding of Cultivated Plants*, 21
Eisman, Louis, and Tanzer, Charles, *Biology and Human Progress*, 164
Fitzpatrick, Frederick L., and Bain, Thomas D., *Living Things*, 191
Gardiner, Mary S., *The Principles of General Biology*, 191
Grimm, William Carey, *The Shrubs of Pennsylvania*, 164
Hyman, Libbie Henrietta, *The Invertebrates: Acanthocephala, Aschelminthes, and Entoprocta—The Pseudocoelomate Bilateria*, 84
Jean, Frank C., Harrah, Ezra C., Herman, Fred L., and Powers, Samuel R., *Man and His Biological World*, 164
Jones, Arthur W., and Carpenter, John M., *Microtechnique. A Student's Guide to Slide Making*, 190
Kaston, B. J., *How To Know The Spiders*, 221
Kinsey, Alfred C., Pomeroy, W. B., Martin, C. E., Gebhard, P. H., and Associates, *Sexual Behavior in the Human Female*, 221
Mavor, James Watt, *General Biology*, 109
Moment, Gardner B., and Close, Helen V., *Foundations of Biology, A Laboratory Handbook*, 190
Moody, Paul Amos, *Introduction to Evolution*, 84
Pennak, Robert, *Fresh-Water Invertebrates of the United States*, 191
Preston, R. D., E.Sc., F.Inst.P., *The Molecular Architecture of Plant Cell Walls*, 164
Rogers, J. Speed, Hubbell, Theodore H., and Byers, C. Francis, *Man and The Biological World*, 191
Royle, Howard A., *Laboratory Exercises in Genetics*, 109
Vinal, William G., *The Outdoor Schoolroom for Outdoor Living*, 110
Welch, Paul S., *Limnology*, 21
Wichterman, Ralph, *The Biology of Paramecium*, 164
Bowman, George W., *An Easily Constructed Microprojector for Drawing Purposes*, 150
Brice, Arthur T., *On the Zernike Phase-Contrast Method of Microscopy*, 124
Burning the Underbrush, Samuel L. Meyer, 95
Caracoles at Vinales, Cyril E. Abbott, 49
Card Holder for the Opaque Projector, O. W. Neher, 128
Cat Skeleton-Viscera, M. C. Miller, 177
Classroom Procedures in General Biology, Elma W. McConnell, 15
Comparative Study of Objectives, Content, and Methodology of Introductory College Courses in Zoology, A, Louis Lutz, 76
Conservation Education, Free and Inexpensive Materials for, Muriel Beuschlein, 35
Conservation in the 83rd Congress, 48
Cooperative Committee of the American Association for the Advancement of Science, The, 66
Davis, Leonard R., *An Easily Constructed Microprojector for Drawing Purposes*, 150
Dodd, John D., *Science—A Modern Fountain for Youth*, 20
Drawings, The Use of in General Zoology, Raymond Greb, 18
Easily Constructed Microprojector for Drawing Purposes, An, Leonard R. Davis, George W. Bowman, 150
Ecology in Conservation, The, Howard H. Michaud, 72
Educational Packet, 48
Enzymatic Aid for Euglena, Howard Baker, 154

Film Showings at the AAAS, 97
Flightless Birds of New Zealand; Extinct and Near Extinct, Katherine V. W. Palmer, 103
Food-Chain Culture of Daphnia, E. F. Barrows, Eric Schwab, 149
Fossil Story For Children, A, Loye Miller, 207
Fowler, H. Seymour, *The Iowa Teacher's Conservation Camp*, 61
From the Retiring Editor, 155
Gabrielle, Sister M., *"How I Did It,"* 212
General Education Type of Biology Course, Sister Mary Aquin Miller, 51
Gering, Robert L., *Participative Visual Aids*, 93
Goddard, Charles A., *Try a Hydroponic Garden*, 12
Greb, Raymond, *The Use of Drawings in General Zoology*, 18
Growing Fern Prothallia, 65
Hadley, Charles E., *Living Damsel Fly Larvae as Supplementary Material for the Study of Insects*, 107
"How I Did It," Sister M. Gabrielle, 212
Huxley, Dr. Julian, *Wins Kalinge Award*, 149
Hydroponic Garden, Try A, Charles A. Goddard, 12
Hydroponics—New Techniques, Brother G. Nicholas, 219
Importance of Comparative Histology in Education, The, Helmer P. K. Agersborg, Ph.D., 69
Increase In Dues, 123
Inspiration Via The Disc, Robert Wheeler, 154
Iowa Teacher's Conservation Camp, The, H. Seymour Fowler, Dorothy M. Matala, 61
Kalinge Award, Dr. Julian Huxley Wins, 149
Keene, Irving C., *A Modern Suite of Biology Rooms*, 205
Key to Diagrams of Immature Eggs of Vertebrate and Invertebrate Animals Appearing in the March Issue, 100
Klinge, Paul, *The Superior Science Student in the Senior High School*, 129
Knowledges of Botany Possessed by High School and College Students, George G. Mallinson, 151
Letters, 14, 105, 133, 161, 184, 217
Levardsen, Norman O., *Photomicrographs as a Laboratory Teaching Aid in the Biological Sciences*, 201
Lichtenwalter, M. C., *Biology Laboratories*, 110 165, 188, 218
Living Damsel Fly Larvae as Supplementary Material for the Study of Insects, Charles E. Hadley, 107
Lutz, Louis, *A Comparative Study of Objectives, Content, and Methodology of Introductory College Courses in Zoology*, 76
Mallinson, George G., *Knowledges of Botany Possessed by High School and College Students*, 151
March of Dimes for 1953, 11
Matala, Dorothy M., *The Iowa Teacher's Camp*, 61
McConnell, Elma W., *Classroom Procedures in General Biology*, 15
Meyer, Samuel L., *Burning the Underbrush*, 95
Michaud, Howard H., *The Ecology in Conservation*, 72
Miller, Loye, *A Fossil Story For Children*, 207
Miller, M. C., *Cat Skeleton-Viscera*, 177
Miller, Sister Mary Aquin, *The General Education Type of Biology Course*, 51
Modern Suite of Biology Rooms, A, Irving C. Keene, 205
More Activities by the Pupils, S. M. Pattee, 29
National Membership Chairman, 182
Nature Trail at Roosevelt High School, 53
Neher, O. W., *Card Holder for the Opaque Projector*, 128
New Associate Editors, 159
New Editor-in-Chief, 132
New England Biological Association, 11
Nelson, H. C., *Opportunities for Employment in the Biological Sciences*, 180
New Officers, 15
New Publication Schedule, 48
Nicholas, Brother G., *Hydroponics—New Techniques*, 219
Nominating Committee Report, 158
Oliver, Margaret H., *The School Garden, an Outdoor Laboratory for Teaching*, 5
On the Zernike Phase-Contrast Method of Microscopy, Arthur T. Brice, 124
Open Road to Education for Family Living, The, Arthur J. Baker, 62
Opportunities for Employment in the Biological Sciences, H. C. Nelson, 180
Packard, Charles E., *A Simple Indication of the Efficacy of a Teaching Device*, 166
Palmer, Katherine V. W., *Flightless Birds of New Zealand; Extinct and Near Extinct*, 103
Paloumpis, Andreas A., *The Use of Drosophila Melanogaster in High School Genetics*, 213
Participative Visual Aids, Robert L. Gering, 93
Pattee, S. M., *More Activities by the Pupils*, 29
Petit, Lincoln, *A Guide for Teaching the Scientific Method*, 31
Photomicrographs as a Laboratory Teaching Aid in the Biological Sciences, Norman L. Biggs and Norman O. Levardsen, 201
President's Message, 161
Proposed Changes in Constitution, 159
Radio Transcriptions, 65
Regional Meeting With AIBS, 182
Relieving Anxiety and Fear of Animals in Children, John D. Woolever, 178
Sanders, J. M., and Committee, *Sources of Strip Films and Color Slides*, 184
School Garden, an Outdoor Laboratory For Teaching, Margaret H. Oliver, 5
Science, A Modern Fountain For Youth, John D. Dodd, 20
Scientific Method, A Guide for Teaching, Lincoln Petit, 31
Schwab, Eric, *Food-Chain Culture of Daphnia*, 149
Seashore, Down to the, Joan Woods, 8
Seashore Project Inshore, A, Erma Vance, 145

Simple Indication of the Efficacy of a Teaching Device, A, Charles E. Packard, 166
Smith, Robert L., *Biology Clubs as Teaching Tools*, 186
Some Educational Activities of the National Wildlife Federation, Walter P. Taylor, 81
So This Is an "Air Fern"? Arthur J. Baker, 101
Sources of Strip Films and Color Slides, J. M. Sanders and Committee, 184
St. Louis Meeting, 23
Superior Science Student in the Senior High School, The, Paul Klinge, 129
Taylor, Walter P., *Some Educational Activities of the National Wildlife Federation*, 81
Trees Along the Nature Trail at Roosevelt High School, 53
Use of Balsa Wood in the Preparation of Skins of Small Mammals, The, Allen H. Benton, 148
Use of Drosophila Melanogaster in High School Genetics, The, Andreas A. Paloumpis, 213
Vance, Erma, *A Seashore Project Inshore*, 145
Watson, Helen Field, *A "Your" Man Teaches Biology*, 221
Wheeler, Robert, *Inspiration Via the Disc*, 154
Why Should I Be a Member of NABT?, 182
Woods, Joan, *Down to the Seashore*, 8
Woolever, John D., *Animals and Why Children Fear Them*, 122
Woolever, John D., *Relieving Anxiety and Fear of Animals in Children*, 178
"Your" Man Teaches Biology, A, Helen Field Watson, 122

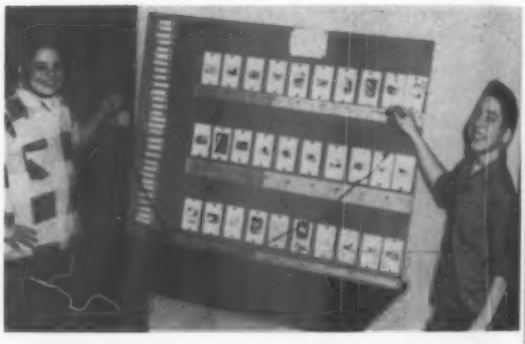
A Changeable Electric Bulletin Board

PAUL V. WEBSTER, City Schools, Bryan, Ohio

The electric bulletin board, which is already a well-known teaching aid, may be designed with some interesting innovations.

Our electric bulletin board has a shellaced plywood base, with strips of corkboard to which the pictures and names may be thumbtacked. The corkboard strips were made from scrap pieces of a bulletin board. The contact bolts and taps were placed under the pictures, and to the left of the names, in order to pierce only the plywood. When the circuit is completed between the name and the correct picture, a door buzzer sounds. The buzzer, which was toned down to avoid too much noise, had the bakelite shield replaced by a clear plastic cover made in a plastics class of the school. Thus the operation of the buzzer could be seen by the science students. A cheap transformer was used, eliminating the need for replacing dry cells. The two leads are radio test leads purchased at a local radio shop. The wires connecting the pictures to the names are extra long, so that they can be changed now and then to prevent mere memorization of a sequence pattern.

There is room for 30 small pictures and names. We have found this large enough to be challenging and not too large to be discouraging. An outstanding feature of this electric bulletin board is that it can be changed frequently. Each change constitutes a small project for a student. A change every two weeks provides enough time for the students to gain proficiency on a set this large, and for them to enjoy showing others how well they have conquered a set.



Contact! Dean Crutch, *left*, and John Hardy, *right*, proudly display the electric bulletin board they constructed.

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Simple Indication of the Efficacy of a Teaching Device, A, Charles E. Packard, 166
Smith, Robert L., *Biology Clubs as Teaching Tools*, 186
Some Educational Activities of the National Wildlife Federation, Walter P. Taylor, 81
So This Is an "Air Fern"? Arthur J. Baker, 101
Sources of Strip Films and Color Slides, J. M. Sanders and Committee, 184
St. Louis Meeting, 23
Superior Science Student in the Senior High School, The, Paul Klinge, 129
Taylor, Walter P., *Some Educational Activities of the National Wildlife Federation*, 81
Trees Along the Nature Trail at Roosevelt High School, 53
Use of Balsa Wood in the Preparation of Skins of Small Mammals, The, Allen H. Benton, 148
Use of Drosophila Melanogaster in High School Genetics, The, Andreas A. Paloumpis, 213
Vance, Erma, *A Seashore Project Inshore*, 145
Watson, Helen Field, *A "Your" Man Teaches Biology*, 221
Wheeler, Robert, *Inspiration Via the Disc*, 154
Why Should I Be a Member of NABT?, 182
Woods, Joan, *Down to the Seashore*, 8
Woolever, John D., *Animals and Why Children Fear Them*, 122
Woolever, John D., *Relieving Anxiety and Fear of Animals in Children*, 178
"Your" Man Teaches Biology, A, Helen Field Watson, 122

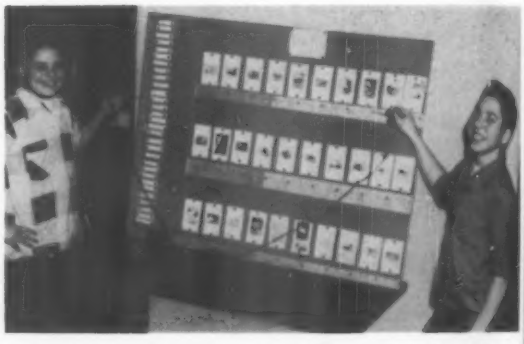
A Changeable Electric Bulletin Board

PAUL V. WEBSTER, City Schools, Bryan, Ohio

The electric bulletin board, which is already a well-known teaching aid, may be designed with some interesting innovations.

Our electric bulletin board has a shellaced plywood base, with strips of corkboard to which the pictures and names may be thumbtacked. The corkboard strips were made from scrap pieces of a bulletin board. The contact bolts and taps were placed under the pictures, and to the left of the names, in order to pierce only the plywood. When the circuit is completed between the name and the correct picture, a door buzzer sounds. The buzzer, which was toned down to avoid too much noise, had the bakelite shield replaced by a clear plastic cover made in a plastics class of the school. Thus the operation of the buzzer could be seen by the science students. A cheap transformer was used, eliminating the need for replacing dry cells. The two leads are radio test leads purchased at a local radio shop. The wires connecting the pictures to the names are extra long, so that they can be changed now and then to prevent mere memorization of a sequence pattern.

There is room for 30 small pictures and names. We have found this large enough to be challenging and not too large to be discouraging. An outstanding feature of this electric bulletin board is that it can be changed frequently. Each change constitutes a small project for a student. A change every two weeks provides enough time for the students to gain proficiency on a set this large, and for them to enjoy showing others how well they have conquered a set.



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lecturer in zoology, botany, and general biology at the university in Brunswick, West Germany.

One of the first questions Dr. Beatus asked of a biological nature was, "Do you take many 'excursions' with your classes?" TOF explained that Wells is in a congested district of Chicago; field trips had been tried, but were difficult to supervise because of the economic status of many students and transportation difficulties. An occasional trip to the zoo or conservatory is the exception. Dr. Beatus said that his classes take three walks per week, from 3:30 to 8:00 A.M., for the study of birds and their songs. Saturday and Sunday trips of a longer duration are also a part of their schedule. On days when he does not take excursions, he is in his office at 6:30 A.M. Besides his regular teaching load, he conducts research on chromosome mutations in plants.

Principal Frederick took Dr. Beatus on a tour of the school. He was then escorted to TOF's afternoon class for observation. Wells, being very cosmopolitan, has many nationalities. He was greeted by one of the students in excellent high school German. After introducing Dr. Beatus to the class, TOF briefly explained his teaching philosophy. The students were as interested as the Doctor. In brief, it was a philosophy of how to live better, get along with people, and be a happy individual. The students then took over for the remaining class time.

At the close of the class, Dr. Beatus asked TOF the meaning of "core curriculum," mentioned in the introductory remarks. The Doctor explained that he had spent the previous week at the National College of Education in Evanston, had heard of "core curriculum," but was still a bit hazy as to its meaning. He was given a reprint of TOF's article, "Experiment with Biology in a Core Curriculum," Vol. 12, No. 8, *The American Biology Teacher*.

At TOF's home that evening the family and Dr. Beatus were in the garden having a glass of wine before dinner; an ear of yellow hybrid field corn was on the table nearby. "Maize? Do you eat it?" A negative answer to the latter question explained that it was used for food. Dr. Beatus had never seen sweet corn before, nor tasted it.

During the dinner hour the conversation revolved about comparisons of family life, living conditions, and the cost of living. Dr. Beatus said his family consisted of his Frau and three children. The oldest is 18 years of age. His wife is also a biologist, but his children do not cherish an interest in the subject. It pleased him greatly to observe that TOF's daughter is a biology student. Conversation turned to domestic help. "What do you have? How much do you pay?" He was told that domestic help does not exist in the Midwest. Industry takes these people. Mrs. Lichtenwalter did explain that one woman on a nearby street had a woman "come in" for $7.50 per day, plus car fare, a meal, and "a coffee break." He stated that, for the equivalent of $7.00 they could employ a woman for a whole month. Taxes in Germany are 20% for the State, an additional 27% for Berlin, and an additional 7% for church (if you attend the latter).

Teachers in Germany are not well-paid. Elementary teachers receive $90.00 per month, with increments every two years to near the equivalent of $140.00. They are paid by the State. Transfers from one branch of service to another do not exist. Dr. Beatus receives 1,100 D marks, or about $280.00 a month. Retirement is compulsory at 65. The pension is set at three-fourths of the teaching salary. Milk is 10 cents a quart, and coffee $4.00 per pound. Most families use a coffee substitute of roasted barley and rye, at a few pennies per pound. Rent for six rooms is about $35.00 per month. After describing the accommodations, this proved slightly lower than in Chicago. There is electricity for lights, an electric vacuum, and a small radio. No other appliances are available on a teaching salary. Foods are kept cool in the basement. Dr. Beatus enjoyed U. S. ice cream. In Germany it is more of an ice. He marveled at the abundance of foods and the complex methods by which we process them. He feels that we are foolish to pasteurize, evaporate, powder, condense, and dehydrate foods.

The teaching year is divided into four terms. Between terms, the instructors in teacher-training schools visit at least 12 of their students doing practice teaching in one-room schools. Dr. Beatus, in addition, takes a group of nearly 100 students on an 18-day summer tour of Northern Europe. The tour is by bus into Italy, France and adjacent areas, and costs the student $40.00, paid to the State.

The final hand-shake at the hotel was accompanied by thanks for a small box of recent American biology textbooks from TOF's library.

It is apparent that these people are doing a fine job in education. Their city was 80% destroyed during the war; in many instances their population has been doubled by displaced persons; both are enormous handicaps. Germany's representative is well-versed in botany, and he has a keen insight into education, as displayed by his eagerness for more knowledge about the "core curriculum."

Books For Busy Biologists

SPEAR, F. G. *Radiations and Living Cells*. John Wiley & Sons, New York. xii + 222 pp. illus. 1953. $3.50.

Although isotope research with living cells is a new and rapidly expanding field, this British summary notes the extensive history and wider aspects

of cell radiation science. It is aimed at the intelligent but non-specialist reader. Biology teachers will find this a valuable book to tell of the precise effects of various types of radiation within and on all types of cells—material seldom found in general texts.

PAUL KLINGE, *Associate Editor*

HARBAUGH, M. J. and GOODRICH, A. L., EDS. *Fundamentals of Biology*. The Blakiston Company, Inc., New York. vii + 611 pp. illus. 1953. $6.00.

This is a new college text which is aimed at the general student not majoring in biology. Written by a committee of six biologists from Kansas State College, this book uses the functional approach in emphasizing basic biological principles with a minimum of detail. There is an interesting approach to ecology but, in general, the authors follow the orthodox arrangement of material.

PAUL KLINGE, *Associate Editor*

ELLIOTT, ALFRED M. *Zoology*. Appleton-Century-Crofts, Inc., New York. x + 719 pp. illus. 1952. $6.00.

Numerous original diagrams, although of unequal quality, are a novel feature of this book although some readers may dislike the purposely distorted perspective and cartoon-like treatment of many. Halftones are uniformly well-chosen and beautifully reproduced. The text style in 2-column arrangement is simple and clear for the average college freshman or above-average high school student. The central theme is Evolution; the treatment is phylogenetic, although taxonomy is not emphasized. The approach is historical. Some groups receive brief attention. The chordates as a phylum receive only 83 pages, supplemented, however, by 164 pages on "Organ Systems of Man" in which there is some comparative material.

EDWARD C. COLIN,
Chicago Teachers College

SHUTTLESWORTH, DOROTHY E. *Exploring Nature With Your Child*. Greystone Press, New York 13. 448 pp. illus. 1952. $3.95.

Elementary teachers and parents of younger children will find many ideas for school and home aquaria, the care and feeding of animals, care of plants, field trips, and other nature study projects and hobby interests, as well as interesting reference materials in this attractive and easy-to-read book. As a pupil reference book, it is suitable for Grades 4 through 8. The author is on the Staff of The American Museum of Natural History, is Editor of *Junior Natural History Magazine* and, as such, is well acquainted with her subject. The book is rather well illustrated with photographs and drawings, and has a comprehensive index. It could well be in every elementary classroom, home, and school library.

ERMA VANCE,
Butler Twp. Elementary Schools

Biology in the News

I Dieted Because I Wanted to Look Like the Other Kids, Dawn C. Norman, *Ladies Home Journal,* Dec. 1953, pp. 66 & 127.

Are boys conscious of extra poundage? Do they diet? Lyle tells what he did to reduce. The article includes some model diets, but wisely suggests that reducing diets be supervised by the family physician.

Why Patients Are Mad at Their Doctors, Stanley Frank, *Redbook,* Dec. 1953, pp. 32–33 & 71–72.

A new report on the six biggest complaints against our medical men—and what can be done about them.

Creatures of the Sea, Lincoln Barnett, *Life,* Nov. 30, 1953, pp. 78–108.

The seventh in the series, The World We Live In. East set of illustrations in this series seems to be more gorgeous than those which preceded it. These pictures, most of which are in natural color, are invaluable in teaching the wonderful diversity of life forms. You will need more than one set for your permanent files.

World Science Gets the Lowdown on Piltdown, *Life,* Dec. 7, 1953, pp. 153–158.

An article, made up mostly of pictures, which can be used either to stimulate discussion of the fact-finding methods of science, or to promote research and discussion of man's early origin.

I've Got the Lonesomest Disease! Helen Furnas, *Sat. Ev. Post,* Nov. 21, 1953, pp. 24–25 & 110–119.

Hemophilia is always of interest to students, and this article will increase their interest. It presents much valuable information in a most pleasing style.

Super-Animals for Super-Foods, Norman and Madelyn Carlisle, *Coronet,* Dec. 1953, pp. 79–82.

Both plants and animals are undergoing changes which allow them to withstand environmental conditions or make them more productive. Man's application of genetics enables him to breed into living things the characteristics he desires.

Chiropractic—Science or Quackery? James Phelan, *Cosmopolitan,* Dec. 1953, pp. 86–89.

A calm analysis of a white-hot controversy that has raged in the healing profession for a half-century.

The Original Miracle Drug, Harry Henderson, *Collier's,* Nov. 27, 1953, pp. 112–117.

Few people class aspirin among the miracle drugs, yet it is the commonest pain-killer used by Americans. This article contains many facts and figures which are of interest to all of us.

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Articles are scheduled for publication in approximately the order of acceptance of the manuscripts. Generally the journal is tentatively arranged about three or four issues ahead, and there are under consideration at any time enough manuscripts for about two or three more issues. Some space is of course allowed for news items and articles of a seasonal nature. Many seasonal papers have to be postponed an entire year, simply because the author has not allowed the necessary four to six months that intervenes between acceptance and publication.

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